An integrated unit focusing on the management decisions regarding one of Arizona's major predators

Mountain Lions in Arizona

Lesson 3: Humans and Lions – Sharing Space Through Time

LESSON OVERVIEW

In this lesson, students will explore how habitat loss can affect the population of mountain lions. They will interpret a map that illustrates the historic and current range of mountain lions in the United States. After making a human population density map, they will compare the ranges of the two species to see if there is a relationship.

SUGGESTED GRADE LEVELS

- 6 – 12

ENDURING UNDERSTANDINGS

- Human population growth can negatively affect the survival of other species.

OBJECTIVE

Students will:

- Learn how to read and interpret maps.
- Create a population density map given current data.
- Compare and contrast maps showing different data.

ARIZONA DEPARTMENT OF EDUCATION STANDARDS

Grade	Science	Social Studies
6	S1-C3-01; S1-C3-04; S4-C3-02	S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-02
7	S1-C3-01; S1-C3-05; S3-C1-01; S4-C3-04	S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-05; S4-C5-06
8	S1-C3-01; S1-C3-05	S1-C1-01; S1-C1-02; S4-C1-01; S4-C1-03; S4-C4-02
High School	S3-C1-01; S3-C1-03	S1-C1-01; S1-C1-04; S1-C1-07; S4-C1-02; S4-C5-05

Note: The full text of these standards can be found in Appendix A.

TIME FRAME

- 1 day (45 minutes)

MATERIALS

- *Mountain Lions Through Time* worksheet (1 per student)
- *Humans Through Time* worksheet (1 per student)
- Crayons or colored pencils
- Wall map of the United States
- Picture of the United States at night (optional)

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TEACHER PREPARATION

- Make copies of the two worksheets for each student. The *Humans Through Time* worksheet can be copied double-sided with the map on the back.

SUGGESTED PROCEDURES

1. Ask students: Where in the United States do you think mountain lions can be found and why? They can answer in the form of a journal entry or a class discussion. Solicit ideas from students, using a wall map to reinforce their understanding. Discuss whether humans affect where mountain lions might be found. Tell students that they had some good thoughts but now it is time to look at the evidence.
2. Hand out the *Mountain Lions Through Time* worksheet. Allow time for students to look at the map and answer the questions at the bottom of the page.
3. When students have completed the worksheet, discuss their answers as a class. Be sure they understand that some of the questions may not have a correct answer at this time. All we can do, as scientists, is look at the data and try to draw conclusions. Later, when more data have been collected, we may be able to reach a more definitive answer.
4. Hand out the *Humans Through Time* worksheet and inform students that now we have a little more information. Explain that the United States takes a census, or a count, of all of its citizens every 10 years. From this information, we can calculate "population density," or the number of people per square mile. This data table shows the population densities of each state in 1880 and 2000. Notice that we have human population data for a year when the mountain lion inhabited its historic range and for a more current year.
5. Allow time for students to answer the questions at the bottom of the page. When they have finished, they are to color the map on the backside according to the population density of each state in 2000, and then to answer the questions pertaining to the map. If they do not finish in class, they can complete the assignment for homework.
6. When students have completed the worksheet, discuss any trends they may have noticed. If they do not point it out, you must guide them to a general conclusion that historically mountain lions could be found in parts of the United States where the population density of humans was low. Ask the students what this might mean in the future as the population of the United States continues to grow. Explore ways in which humans and mountain lions might coexist.
7. *Alternative Discussion:* Show the picture of the United States at night that was taken from space. Ask the students if, indeed, there seems to be a relationship between the density of humans and the current location of mountain lions.
8. Collect the *Mountain Lions Through Time* and *Humans Through Time* worksheets.

ASSESSMENT

- *Mountain Lions Through Time* worksheet
- *Humans Through Time* worksheet
- Class discussions

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EXTENSIONS

- Students can research the population density of mountain lions to confirm the idea that more mountain lions will be found in areas with less people.
- Encourage students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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Appendix A: Arizona Department of Education Standards – Full Text

Science Standards

Grade	Strand	Concept	Performance Objective
6	1	3 – Analysis and Conclusions	1 – Analyze data obtained in a scientific investigation to identify trends 4 – Interpret simple tables and graphs produced by others
	4	3 – Populations of Organisms in an Ecosystem	2 – Describe how population density can affect the quality of life
7	1	3 – Analysis and Conclusions	1 – Analyze data obtained in a scientific investigation to identify trends 5 – Formulate a conclusion based on data analysis
	3	1 – Changes in Environment	1 – Analyze environmental risks caused by human interaction with biological or geological systems
	4	3 – Populations of Organisms in an Ecosystem	4 – Evaluate data related to problems associated with population growth and the possible solutions
8	1	3 – Analysis and Conclusions	1 – Analyze data obtained in a scientific investigation to identify trends 5 – Explain how evidence supports the validity and reliability of a conclusion
High School	3	1 – Changes in Environments	1 – Evaluate how the processes of natural ecosystems affect, and are affected by, humans 3 – Assess how human activities can affect the potential for hazards

Social Studies Standards

Grade	Strand	Concept	Performance Objective
6	1	1 – Research Skills for History	1 – Construct charts, graphs, and narratives using historical data 2 – Interpret historical data displayed in graphs, tables, and charts
	4	1 – The World in Spatial Terms	1 – Construct maps, charts, and graphs to display geographic information 3 – Interpret maps, charts, and geographic databases using geographic information
		4 – Human Systems	2 – Describe the environmental, economic, cultural and political effects of human migrations and cultural diffusion on places and regions

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Social Studies Standards Continued

Grade	Strand	Concept	Performance Objective
7	1	1 – Research Skills for History	1 – Construct charts, graphs, and narratives using historical data 2 – Interpret historical data displayed in graphs, tables, and charts
	4	1 – The World in Spatial Terms	1 – Construct maps, charts, and graphs to display geographic information 3 – Interpret maps, charts, and geographic databases using geographic information
		4 – Human Systems	5 – Analyze the effects of settlement on places (e.g., quality of life, transportation, population density)
		5 – Environment and Society	6 – Describe the ways human population growth can affect environments and the capacity of environments to support populations
8	1	1 – Research Skills for History	1 – Construct charts, graphs, and narratives using historical data 2 – Interpret historical data displayed in graphs, tables, and charts
	4	1 – The World in Spatial Terms	1 – Construct maps, charts, and graphs to display geographic information 3 – Interpret maps, charts, and geographic databases using geographic information
		4 – Human Systems	2 – Describe the effects (e.g., economic, environmental, cultural, political) of human migrations on places and regions
High School	1	1 – Research Skills for History	1 – Interpret historical data displayed in graphs, tables, charts, and geologic time scales 4 – Construct graphs, tables, timelines, charts and narratives to interpret historical data 7 – Compare present events with past events: a. cause and effect b. change over time c. different points of view
	4	1 – The World in Spatial Terms	2 – Interpret maps and images (e.g., political, physical, relief, thematic, Geographic Information Systems [GIS] and LandSat)
		5 – Environment and Society	5 – Analyze how humans impact the diversity and productivity of ecosystems

Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Mountain Lions Through Time* – A historical look at the range of mountain lions in the United States. Poses questions regarding trends. (1 page)

B. *Humans Through Time* – A comparison between two years of human population density in the United States. Poses questions regarding trends. (2 pages)

C. *United States at Night* – A picture showing the lights of cities at night. (1 page)

Mountain Lions Through Time

Below is a map of the current and historic (pre-1920) ranges for the mountain lion in the United States. Use the map to answer the questions.

*Figure 1: Current and Historic Range of Mountain Lions in the United States**

* Recent evidence indicates that the mountain lion may be extending its range

QUESTIONS

1. In how many states could mountain lions be found before 1920?

2. In how many states can mountain lions now be found?

3. Why has such a dramatic decline occurred in the lion's range?

4. What is the overall trend in the mountain lion's current range?

5. What could be the reason for this trend?

6. Why have mountain lions been able to survive in Florida?

Humans Through Time

Below is a data table that shows the population density for each state in 1880 and 2000. Use the table to answer the questions below.

Table 1: Population Densities for United States, 1880 and 2000

State, Region, or Territory	Population Density (people/square mile)	
	1880	2000
Alabama	24.9	87.6
Alaska	0.1	1.1
Arizona	0.4	45.2
Arkansas	15.4	51.3
California	5.5	217.2
Colorado	1.9	41.5
Connecticut	131.1	702.9
Dakota Territory	0.9	N/A
Delaware	69.2	401.1
District of Columbia	2960.6	9316.4
Florida	4.5	296.4
Georgia	26.5	141.4
Hawaii	N/A	188.6
Idaho	0.4	15.6
Illinois	55.6	223.4
Indiana	58.5	169.5
Iowa	29.5	52.4
Kansas	12.3	32.9
Kentucky	43.8	101.7
Louisiana	22.7	102.6
Maine	18.5	41.3
Maryland	84.0	541.9
Massachusetts	228.6	809.8
Michigan	29.0	175
Minnesota	9.3	61.8
Mississippi	24.0	60.6

State, Region, or Territory	Population Density (people/square mile)	
	1880	2000
Missouri	33.2	81.2
Montana	0.3	6.2
Nebraska	6.0	22.3
Nevada	0.6	18.2
New Hampshire	37.4	137.8
New Jersey	135.9	1,134.40
New Mexico	1.0	15
New York	108.2	401.9
North Carolina	27.6	165.2
North Dakota	N/A	9.3
Ohio	80.0	277.3
Oklahoma	N/A	50.3
Oregon	1.8	35.6
Pennsylvania	93.1	274
Rhode Island	211.7	1,003.20
South Carolina	29.3	133.2
South Dakota	N/A	9.9
Tennessee	33.8	138
Texas	5.8	79.6
Utah	1.7	27.2
Vermont	32.5	65.8
Virginia	39.4	178.8
Washington	1.1	88.6
West Virginia	26.9	75.1
Wisconsin	24.4	98.8
Wyoming	0.2	5.1
United States	14.0	79.6

Data courtesy of the U.S. Census Bureau http://www.census.gov

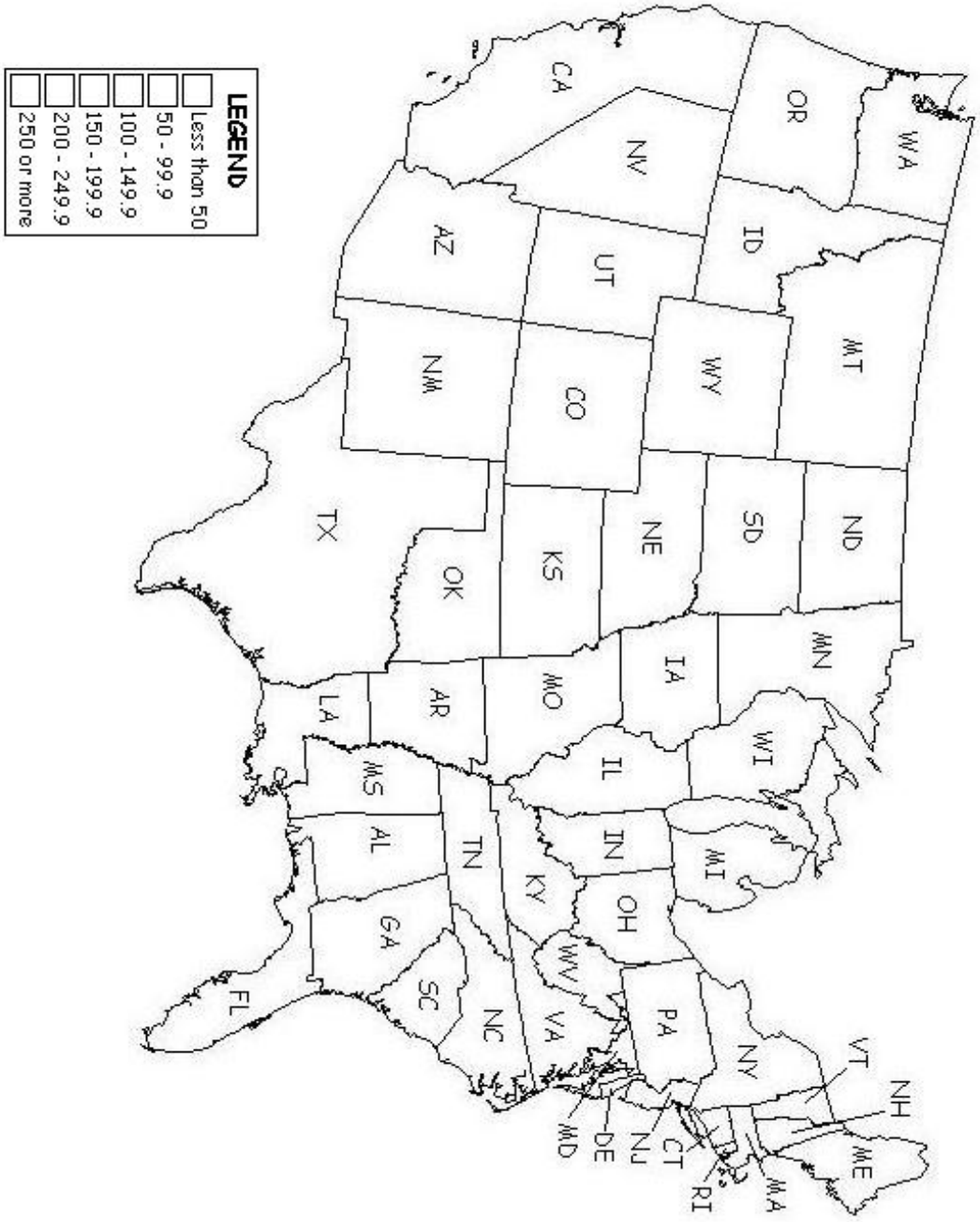
1. Explain why no data are available for Hawaii, Oklahoma, and North and South Dakota in 1880.

2. What trend do you notice between the population densities of the states in 1880 and in 2000?

3. Which state or region has the largest population density? Why? Which has the smallest? Why?

Use the 2000 Population Density data to color the map below. The densities will be divided into six ranges: less than 50, 50 – 99.9, 100 – 149.9, 150 – 199.9, 200 – 249.9, and 250 or more. Select six colors — one for each density range — and color the map and the legend. Answer the questions at the bottom.

Figure 2: United States Map with Postal Abbreviations



1. What basic trend do you notice about the colored map?

2. Why would the ranges used to represent the 2000 population density not be very good to represent the 1880 data?

3. Compare this map to the current range of the mountain lion. What do you notice?

The United States at Night

Below is a photograph of North and Central America showing the United States at night. The lighted areas indicate the places where people live.